KINDER MORGAN

Delivering Energy to Improve Lives

Sur-rebuttal of Kinder Morgan: Engines and Turbines (Section 113)

Proposed Rule 20.2.50 – Oil and Gas Sector – Ozone Precursor Pollutants
Commencement of Hearing: September 20, 2021

Technical Witness

- James Trent, Staff Engineer, Kinder Morgan

- Resume and qualifications at Exhibit III of the Kinder Morgan NOI to Present Direct Technical Testimony

Case-by-Case Feasibility

NMED has added two provisions for alternative compliance with the Section 113 standards:

1. An Alternative Compliance Plan (ACP)
2. An individual alternative emission standard

We support these proposals and ask that the Board adopt Paragraphs B(10) and B(11) as proposed.

Case-by-Case Feasibility

KINDER MORGAN

NM Senate Bill 8 (revising the Air Quality Control Act):

F. In making its rules, the environmental improvement board or the local board shall give weight it deems appropriate to all facts and circumstances, including:

(1) character and degree of injury to or interference with health, welfare, visibility and property;

(2) the public interest, including the social and economic value of the sources and subjects of air contaminants; and

(3) technical practicability and economic reasonableness of reducing or eliminating air contaminants from the sources involved and previous experience with equipment and methods available to control the air contaminants involved.

Because certain retrofits would be exorbitantly expensive to undertake and only yield small emission reductions, even with the revised standards set out in the September 16 draft, it is a priority and the Board's statutory obligation that the process for an alternative emissions limit is clear and workable.

Kinder Morgan Case Studies

Based on the original limits, we analyzed cost data to add NOx controls for four compressor stations:

Turbines

- **Caprock**: Two GE, 5,000-7,000 HP range
- **Rio Vista**: Two Solar, ~1,000 HP

Original standard: 50 ppm NOx

Engines

- **Monument**: Two Cooper Bessemer two-stroke lean burn, ~1,000 HP
- **Washington Ranch**: Two Cooper Bessemer two-stroke lean burn; ~4,500 HP

Original standard: 0.50 g/bhp-hr

Data Collection and Analysis Process

Process to build a cost estimate for adding controls to an engine or turbine:

- Project lead submits a request for an estimate.
- Internal kick-off meeting with all involved departments.
- Each department completes its cost estimate assignment.
- Each department submits results of its assignment to the estimating group.
- Estimating group compiles and synthesizes all inputs, and adds standard costs (*e.g.*, company labor).
- Review process:
  - Project manager review and approval.
  - Project management director review and approval.
  - Project management VP review and approval.

This process takes approximately four to six weeks.

We then use the final estimate to analyze the cost-effectiveness (*i.e.*, the cost per ton) of the required controls.

Initial Cost Per Ton Analysis Methodology

- **Baseline annual emissions**: Representative emissions test result in lb/hr multiplied by representative operating hrs/yr
- **Emissions reduction**: From baseline annual emissions to applicable NOx limit
- **Capital investment**: Based on vendor quote/information for control equipment plus other costs
- **Annualized capital investment**: Based on interest rate, life of control, and total capital costs
  - Interest rate = 3.25% (EPA default)
  - Life of control period = 20 years (EPA Air Pollution Control Cost Manual)
- **Annual O&M costs**: Based on EPA Cost Control Spreadsheet

Data Collection and Analysis Results

Facility	Unit	Model	ISO Rated HP	NOx standard	Required Control Technology	Cost
Caprock	A-01	GE Model MS3702R-C Turbine	7040	50 ppmvd Limit remains the same as originally-proposed in Sept 16 Draft	SCR	$7,180,921 total capital cost $612,350 total annual cost $80,398 per ton of NOx reduced
	A-02	GE Model MS3572R-C Turbine	5700			$11,430,361 total capital cost $914,265 total annual cost $54,935 per ton of NOx reduced

Caprock

- NMED's rebuttal testimony (Ex. 1) states that Kinder Morgan used:
  - (1) unrepresentative baseline data, and
  - (2) limited emissions reductions to those needed to reach the proposed emission limit.

    NMED states this results in inflated costs.

- To address these concerns, we conducted additional cost per ton analyses for the Caprock station.

Caprock – High-end

Case	NOx Reduction	Operating Time Frame	Unit	Average Hours	Reeducation (%)	SCR Capital Cost	Total Annual Cost*	Emission Reduction	Cost Effectiveness
						($)	($)	(tpy)	($/ton)
Original	Reach 50 ppm of NOx	2018-2020	A-01	670	66.2	7,180,921	612,350	7.6	**80,398**
			A-02	3522	56	11,430,361	914,265	16.6	**54,935**
10 Year operating hour average	Reach 50 ppm of NOx	2011-2020	A-01	332	66.2	7,180,921	612,350	3.8	**162,099**
			A-02	1355	56	11,430,361	914,265	6.4	**142,757**
10 Year operating hour average	70% Reduction	2011-2020	A-01	332	70	7,180,921	612,350	4.0	**153,234**
			A-02	1355	70				

- 10-year average operating hours * most recent stack test result
- Reductions down both to 50 ppm limit (KMI method) AND 70% reduction (NMED method)

Conclusion: Costs are higher than prior estimate because unit was run more in the last three years than in the last ten.

Caprock – Low-end

Case	NOx Reduction	Operating Time Frame	Unit	Average Hours	Reeducation (%)	SCR Capital Cost ($)	Total Annual Cost* ($)	Emission Reduction (tpy)	Cost Effectiveness ($/ton)
10 Year operating hour average	Reach 50 ppm of NOx	2011-2020	A-01	332	74.7	7,180,921	612,350	5.7	**107,483**
			A-02	1355	81	11,430,361	914,265	21.6	**42,264**
10 Year operating hour average	70% Reduction	2011-2020	A-01	332	70	7,180,921	612,350	5.3	**114,675**
			A-02	1355	70	11,430,361	914,265	18.6	**49,039**

- 10-year average operating hours * permitted operating limits in lb/hr
- Reductions down both to 50 ppm limit (KMI method) AND 70% reduction (NMED method)

Conclusion: Costs remain **very** high.

Caprock

Caprock, as only one example, illustrates the need for a clear and workable alternative emission standard process based on case-by-case technical and cost considerations.

Case-by-Case Feasibility

As set out in the September 16 draft, we support NMED's proposals for:

1. An Alternative Compliance Plan (Section 113.B.(10)), and
2. An individual alternative emission standard (Section 113.B.(11)).

Questions?